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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/197,767	11/23/1998	HISASHI OHTANI	0756-1896	1677

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NIXON PEABODY, LLP
401 9TH STREET, NW
SUITE 900
WASINGTON, DC 20004-2128

EXAMINER	
CAO, PHAT X	
ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 12/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application N .	Applicant(s)	
	09/197,767	OHTANI ET AL.	
	Examin r	Art Unit	
	Phat X. Cao	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,16,22-27,40 and 46-74* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,16,22-27,40 and 46-74* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. the cancellation of claims 6-15 is acknowledged.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1, 47, 51, 55, 59, 63, 67-68 and 71-72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US. 5,536,950) in view of Fukunaga et al (US. 5,706,064) and Izumi (US. 6,400,428).

With respect to claims 1, 47, 51, 55, 59, and 63, Liu et al disclose in Fig. 4G a semiconductor device comprising: a transistor; at least one interlayer insulating film 78 formed over the transistor, the interlayer insulating film 78 having a contact hole; an embedded conductive layer 82 provided to fill the contact hole wherein a top surface of the embedded conductive layer 82 is flush with a top surface of the interlayer insulating film 78; and a pixel electrode TM2 (column 5, lines 37-39) formed on the interlayer insulating film 78 wherein the pixel electrode TM2 is electrically connected to the transistor through the embedded conductive layer 82.

Liu et al do not disclose the embedded conductive layer 82 being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive

layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Liu's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34). Furthermore, it also would have been obvious to form Liu's pixel electrode being either a transparent electrically conductive film or a reflective electrical conductive film depending upon the display device type which is desired for the liquid crystal display device, as taught by Izumi (column 6, lines 15-20).

With respect to claims 67-68 and 71-72, Fukunaga et al (Fig. 17) further teach the obviousness of forming an embedded conductive layer 411b comprising a same resin as the resin of the interlayer insulating film 413 (see column 19, lines 27-35 and column 42, lines 50-52), wherein the embedded conductive layer 411b comprises an organic resin film containing a conductive material dispersed therein or an inorganic film containing a conductive material disperse therein (column 41, lines 22-32).

4. Claims 2, 22-27, 40, 48, 52, 56, 60 and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al in view of Yamazaki (US. 5,990,542), Fukunaga et al and Izumi (US. 6,400,428).

With respect to claims 2, 48, 52, 56, 60, and 64, as discussed above, Fig. 4G of Liu et al substantially reads on the claimed invention, except that it does not disclose the interlayer insulating film 78 comprising an organic resin.

However, Yamazaki teaches in Fig. 2B the obviousness of forming the interlayer insulating film 120 made of organic resin (column 5, lines 65-67). Accordingly, it would have been obvious to form the interlayer insulating film 78 of Liu et al with an organic resin, because according to Yamazaki, the interlayer insulating film made of the organic

resin would suppress an electric field from the pixel electrode created later from being disturbed (column 6, lines 1-6).

Neither Liu nor Yamazaki discloses the embedded conductive layer being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Liu's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34). Furthermore, it also would have been obvious to form Liu's pixel electrode being either a transparent electrically conductive film or a reflective electrical conductive film depending upon the display device type which is desired for the liquid crystal display device, as taught by Izumi (column 6, lines 15-20).

With respect to claims 22-27 and 40, Fukunaga et al also teach in column 1, lines 5-30 that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display device has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to one ordinary skill in the art to apply the display device of Fukunaga et al to a display device of a cellular phone, a camcoder, etc., because it is an intended use.

5. Claims 3, 22-27, 40, 49, 53, 57, 61, 65, 69-70, and 73-74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al (US. 6,081,305) in view of Okita (US. 6,097,453) and Fukunaga et al.

With respect to claims 3, 49, 53, 57, 61, and 65, Sato et al disclose in Fig. 2 a semiconductor device comprising: a transistor; a first interlayer insulating film 130 formed over the transistor; a drain electrode 141 formed on the first interlayer insulating film and electrically connected to a drain of the transistor through an opening of the first interlayer insulating film; a second interlayer insulating film 150 formed over the drain electrode and the first insulating film; a capacitor forming electrode 165 formed on the second interlayer insulating film 150 to form a capacitor between the drain electrode 141 and the capacitor forming electrode 165; a third interlayer insulating film 170 formed over the capacitor forming electrode and the second interlayer insulating film; contact holes 171 and 151 opened through the third and second interlayer insulating films to reach the drain electrode; an embedded conductive layer filled in the contact holes; and a reflective pixel electrode 181 is electrically connected to the drain electrode through the embedded conductive layer.

Sato et al do not disclose that the contact holes 171 and 151 are formed as a single contact hole opened through the third and second insulating films.

However, Okita teaches in Fig. 6 the obviousness of forming a single contact hole 508 opened through the third insulating film 109 and second insulating film 601 to reach the drain electrode 108. Accordingly, it would have been obvious to modify the contact holes 171 and 151 of Sato et al by forming a single contact hole, because as is well known, the forming of a single contact hole as taught by Okita would reduce the number of steps in fabricating process.

Neither Sato nor Okita discloses the embedded conductive layer being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Sato's embedded conductive layer with the materials as set forth above, because such materials would provide a color liquid crystal display devices having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34).

With respect to claims 22-27 and 40, Fukunaga et al also teach in column 1, lines 5-30 that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display device has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to one ordinary skill in the art to apply the display device of Fukunaga et al to a display device of a cellular phone, a camcoder, etc., because it is an intended use.

With respect to claims 69-70 and 73-74, Fukunaga et al (Fig. 17) further teach the obviousness of forming an embedded conductive layer 411b comprising a same resin as the resin of the interlayer insulating film 413 (see column 19, lines 27-35 and column 42, lines 50-52), wherein the embedded conductive layer 411b comprises an organic resin film containing a conductive material dispersed therein or an inorganic film containing a conductive material disperse therein (column 41, lines 22-32).

6. Claims 4 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al in view of Okita and Yamazaki (US. 5,990,542).

As discussed in details above, the combination of Sato et al and Okita substantially reads on the claimed invention, including the known feature of forming a material normally used for the electrode (i.e., pixel electrode) in the semiconductor and TFT processes, such as aluminum (as taught by Okita, in column 6, lines 15-19).

The above combination does not disclose the third interlayer insulating film comprising an organic resin.

However, Yamazaki teaches in Fig. 2B the obviousness of forming the ITO pixel electrode on the interlayer insulating film 120 made of organic resin (column 5, lines 65-67). Accordingly, it would have been obvious to form the interlayer insulating film 170 of Sato et al with an organic resin, because according to Yamazaki, the interlayer insulating film made of the organic resin would suppress an electric field from the pixel electrode created later from being disturbed (column 6, lines 1-6).

7. Claims 54, 58, 62 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato et al, Okita and Yamazaki as applied to claim (4,50) above, and further in view of Fukunaga et al.

None of the above references discloses the embedded conductive layer being made from the materials as claimed.

However, Fukunaga et al, in Fig. 17, teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-38) or polymer (column 26, lines 54-61). Accordingly, it would have been obvious to form Sato's embedded conductive layer with

the materials as set forth above, because such materials would provide a color liquid crystal display device having high speed response, low power consumption, and low prices, as taught by Fukunaga et al (column 3, lines 30-34).

8. Claims 5, 16, 22-27, 40 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al in view of Fukunaga et al (US. 5,706,064) and Izumi (US. 6,400,428).

With respect to claims 5 and 46, as discussed above, Fig. 4G of Liu et al substantially reads on the claimed invention, except it does not disclose that the embedded conductive layer comprises a same resin as the resin of the interlayer insulating film.

However, Fukunaga et al teach in Fig. 17 the obviousness of forming an embedded conductive layer 411b comprising a same resin as the resin of the interlayer insulating film 413 (see column 19, lines 27-35 and column 42, lines 50-52), wherein the embedded conductive layer 411b comprises an organic resin film containing a conductive material dispersed therein or an inorganic film containing a conductive material disperse therein (column 41, lines 22-32). Accordingly, it would have been obvious to form the embedded conductive layer and the interlayer insulating film with the resin as set forth above, in order to provide a substrate for a display device which can be used in liquid crystal in a high speed response mode and achieves a low price, such as taught by Fukunaga et al (column 1, lines 55-59). Furthermore, it also would have been obvious to form Liu's pixel electrode being either a transparent electrically conductive film or a reflective electrical conductive film depending upon the display device type which is desired for the liquid crystal display device, as taught by Izumi (column 6, lines 15-20).

With respect to claim 16, Fukunaga et al further teach that the embedded conductive layer 411b is made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3) or made of organic conductive layer of carbon (column 20, lines 36-48) or polymer (column 26, lines 54-61), and one of the two conductive layers is in contact with an alignment film 517 (number 517 not shown in Fig. 17, see Fig. 27).

With respect to claims 22-27 and 40, Fukunaga et al also teach in column 1, lines 5-30 that because the liquid crystal display device has high image quality and can be used as switching elements, this kind of display device has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to one ordinary skill in the art to apply the display device of Fukunaga et al to a display device of a cellular phone, a camcoder, etc., because it is an intended use.

9. Claims 1-2, 5, 22-27, 40, 47-48, 51-52, 55-56, 59-60, 63-64, 67-68 and 71-72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukunaga et al (US. 5,706,064) in view of Liu et al (US. 5,536,950) and Izumi (US. 6,400,428).

With respect to claims 1-2, 5, 47-48, 51-52, 55-56, 59-60,63-64, 67-68 and 71-72, Fukunaga (Figs. 24A - 24G) discloses a semiconductor device having an active matrix display device, comprising: forming a first conductive layer 405; forming an insulating layer (413,414) over the first conductive layer; forming an opening in the insulating layer to expose the first conductive layer 405 at a bottom of the opening; forming an embedded conductive layer 418 to cover the insulating layer and the opening (Fig. 24E); etching the embedded conductive layer 418 (Fig. 24F); and forming a second conductive layer on the insulating layer and the embedded conductive layer; and forming a light pixel electrode 412 by patterning the second conductive layer

(column 26, lines 46-48); wherein the pixel electrode 412 is electrically connected to the transistor through the embedded conductive layer 418 or 411b, wherein the embedded conductive layer 418 or 411b comprises an organic resin film made of polymer (column 26, lines 54-61) or carbon (column 20, lines 36-48) which is the same resin as the resin of the interlayer insulating film (column 19, lines 27-35 and column 20, lines 31-57), and wherein the embedded conductive layer 418 or 411b is further made of inorganic oxide conductive layer of ITO or ZnO (column 30, lines 43-46 and column 5, lines 66-67 through column 6, lines 1-3).

Fukunaga does not disclose the top surface of the embedded conductive layer being flush with the top surface of the interlayer insulating film.

However, Liu (Fig. 4G) teaches the steps of depositing the embedded conductive layer 82 in the opening, followed by planarization to flush the top surface of the embedded conductive layer with the top surface of the interlayer insulating film 78, and depositing and patterning the pixel electrode 24 on the embedded conductive layer 82 (column 5, lines 30-39). Accordingly, it would have been obvious to form the embedded conductive layer 418 of Fukunaga being flush with the top surface of the interlayer insulating film in order to provide a unique body tie arrangement for achieving a compact and high reliability display, as taught by Liu (column 2, lines 57-67 through column 3, lines 1-12). Furthermore, it also would have been obvious to form Fukunaga's pixel electrode being either a transparent electrically conductive film or a reflective electrical conductive film depending upon the display device type which is desired for the liquid crystal display device, as taught by Izumi (column 6, lines 15-20).

With respect to claims 22-27 and 40, Fukunaga also teaches that because the liquid crystal display device has high image quality and can be used as switching

elements, this kind of display has been widely used as a display device in a personal computer, television or the like. Accordingly, it would have been obvious to apply the display device of Fukunaga to a cellular phone, a camcorder, etc., because it is an intended use.

Response to Arguments

10. Applicant argues that neither Liu nor Fukunaga discloses that the pixel electrode is a light reflective. However, the new reference is cited in the new ground of rejection to teach the obviousness of forming a pixel electrode as either light reflective or light transparent depending upon the display device which is desired for the liquid crystal display device.

Applicant further argues that it is not obvious to combine Okita with Sato because the references do not suggest the motivation to combine them.

The Examiner recognizes that it is not necessary that the suggestion or motivation must be found within the four corners of the references themselves, a conclusion of obviousness may be made from common knowledged and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference. *In re Bozek*, 416 F. 2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969). In this case, the combination of Okita and Sato would be obvious because one skilled in the art would recognize that changing the contact holes of Sato into a single contact hole as suggested by Okita would reduce number of steps in fabricating process. Furthermore, forming a single conductive plug in direct contact with the drain electrode 141 of Sato's transistor by omitting of conductive layer 164 would be obvious

because it has been held that omission of an element and its function in a combination where the remaining elements perform the same functions as before involves only routine skill in the art. *In re Karlson*, 136 USPQ 184.

Conclusion

11. This action is made non-final.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phat X. Cao whose telephone number is (571) 272-1703. The examiner can normally be reached on Monday - Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

PC
December 12, 2003

PHAT X. CAO
PRIMARY EXAMINER